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PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT  
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference AMS.P52408WO	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP 03/50836	International filing date (day/month/year) 14.11.2003	Priority date (day/month/year) 15.11.2002
International Patent Classification (IPC) or both national classification and IPC G01V1/28		
Applicant WESTERNGECO SEISMIC HOLDINGS LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
- These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:
- I ☒ Basis of the opinion
  - II ☐ Priority
  - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - IV ☐ Lack of unity of invention
  - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - VI ☐ Certain documents cited
  - VII ☐ Certain defects in the international application
  - VIII ☐ Certain observations on the international application.

Date of submission of the demand  27.05.2004	Date of completion of this report  09.03.2005
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Juárez Colera, M  Telephone No. +49 89 2399-2482 

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. **PCT/EP 03/50836**

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-16 as originally filed

**Claims, Numbers**

1-31 received on 01.11.2004 with letter of 01.11.2004

**Drawings, Sheets**

1/5-5/5 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).  
☐ the language of publication of the international application (under Rule 48.3(b)).  
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority in written form.  
☐ furnished subsequently to this Authority in computer readable form.  
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. **PCT/EP 03/50836**

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	1-31
	No: Claims	
Inventive step (IS)	Yes: Claims	2
	No: Claims	1,3-31
Industrial applicability (IA)	Yes: Claims	1-31
	No: Claims	

2. Citations and explanations

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

**1 Prior art**

Reference is made to the following documents:

D1: US-B1-6 333 897 (WARDEBERG JORN ET AL) 25 December 2001 (2001-12-25)

D5: US-A-6 041 282 (WARDEBERG JOERN ET AL) 21 March 2000 (2000-03-21)

**2 Article 33 (1) and (2) PCT (Novelty)**

- 2.1 None of the available prior art documents discloses neither a seismic cable nor a method of producing it with the combination of features described in claims 1 and 20 respectively. The subject matter of these claims is therefore new.
- 2.2 Claims 2-19 and 21-31 are dependent on claims 1 and 20 respectively and as such also meet the requirements of the PCT with respect to novelty.

**3 Article 33 (1) and (3) PCT (Inventive Step)**

- 3.1 The document D1 is regarded as being the closest prior art to the subject-matter of claims 1 and 20, and discloses (abstract; col. 1, l. 35 - col. 2, l. 14 and Figs. 1-3): a seismic cable comprising a sensor module, at least one lead 5 to or from the sensor module, a stress member 2 extending continuously through the sensor module and a sheath 11 enclosing the lead and the stress member and terminating at each end of the sensor module.
- 3.2 The subject-matter of claims 1 and 20 differ from that of D1 in that the lead is deployed in a SZ winding.

- 3.3 The SZ winding is considered as part of the common practice in any field where strands of any kind are used, including the field of seismics (see, e.g. D1; col.1, l. 40-43 and D5; col. 1, l. 66 - col. 2, l. 1).
- 3.4 The subject matter of claims 1 and 20 does therefore not involve an inventive step.
- 3.5 The combination of the features of dependent claim 2, i.e. the direction of the SZ winding changing in the sensor module, in order to protect the leads, is neither known from, nor rendered obvious by, the available prior art.
- 3.6 In the dependent claims 3-19, and 21-31 slight constructional changes in the device of claim 1 and slight variations in the method of claim 20 are defined which come within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can readily be foreseen. Consequently, the subject-matter of these claims also lacks an inventive step.

**4 Article 33 (1) and (4) PCT (Industrial Applicability)**

The subject matter of claims 1-31 is susceptible of industrial application.

ART 34 ANDT

CLAIMS

1. A seismic cable, comprising:  
a sensor module;  
at least one first lead deployed in an SZ winding, wherein the first lead extends to or from the sensor module;  
a stress member extending continuously through the sensor module; and  
a first sheath enclosing the or each first lead and the stress member, the first sheath terminating at each end of the sensor module.
2. A seismic cable as claimed in claim 1, wherein the direction of the SZ winding changes in the sensor module.
3. A seismic cable as claimed in claim 1 or 2 and further comprising: at least one mechanical guide in the sensor module deflecting the stress member.
4. A seismic cable as claimed in claim 1, wherein the sensor module houses at least one of a geophone, an accelerometer, a hydrophone, a tilt meter, and a magnetometer.
5. A seismic cable as claimed in claim 4, wherein the sensor module houses electronics for converting analogue signals to digital signals.
6. A seismic cable as claimed in claim 1, further comprising a second lead extending continuously through the sensor module.

ART 31 AMDT

7. A seismic cable as claimed in claim 4 wherein the second lead is attached to the stress member.
8. A seismic cable as claimed in claim 7, further comprising a second sheath enclosing the second lead and the stress member.
9. A seismic cable as claimed in claim 6 wherein the at least one mechanical guide deflects the second lead.
10. A seismic cable as claimed in claim 6, wherein the second lead is an optical lead or an electrical lead.
11. A seismic cable as claimed in claim 1, further comprising a plurality of leads bundled into at least one bundle.
12. A seismic cable as claimed in claim 11, wherein the bundled leads are enclosed by a protective covering.
13. A seismic cable as claimed in claim 11, wherein the leads include at least one of an optical lead and an electrical lead.
14. A seismic cable as claimed in claim 11, wherein the at least one bundle is cylindrical, oval or flat in cross-section.

ART 34 AMDT

15. A seismic cable as claimed in claim 1, wherein the stress member comprises at least one of an aramide rope, a steel rope, and a utility cable.
16. A seismic cable as claimed in claim 1, further comprising a pair of rings disposed between the first sheath and the first lead and stress member against which the first sheath may be clamped to terminate the sheath.
17. A seismic cable as claimed in claim 16, wherein the sensor module clamps the first sheath against the rings.
18. A seismic cable as claimed in claim 1, wherein the first sheath comprises at least one of a skin, a jacket, or an extrusion matrix.
19. A seismic cable of claim 3, wherein the mechanical guides deflect the first lead.
20. A method of producing a seismic sensor cable, comprising:  
providing a cable core including a stress member and a lead, the lead being deployed in an SZ winding;  
enclosing the cable core in a sheath;  
providing an opening in the sheath; and  
assembling a sensor module to the cable core over the opening such that the stress member extends continuously through the sensor module.



ART 34 AMDT

21. A method as claimed in claim 20, wherein providing the cable core includes layering metallic tape under the sheath on the cable core at a location corresponding to the opening.
22. A method as claimed in claim 21, wherein enclosing the cable core includes extruding the sheath over the length of the cable core.
23. A method as claimed in claim 22, wherein providing the opening includes providing an anti-bonding solution.
24. A method as claimed in claim 23, wherein providing the anti-bonding solution comprises stripping the extruded sheath from the cable core over the metallic tape or other type of anti-bonding solution.
25. A method as claimed in claim 20, wherein providing the cable core includes impregnating the cable core with an anti-bonding agent at a location corresponding to the opening.
26. A method as claimed in claim 25, wherein enclosing the cable core includes extruding the sheath over the length of the cable core.
27. A method as claimed in claim 26, wherein providing the opening includes stripping the extruded sheath from the cable core over the anti-bonding agent.

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21

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- ART 34 AMDT
28. A method as claimed in claim 20, further comprising providing a pair of rings on the cable core under the sheath to define a location for the opening.
29. A method as claimed in claim 28, wherein providing the opening includes providing the opening at the defined location for the opening.
30. A method as claimed in claim 28, further comprising clamping the sheath on the rings to terminate the sheath on each end of the opening.
31. A method as claimed in claim 28, wherein assembling the sensor module to the cable core includes clamping the sheath on the rings to terminate the sheath on each end of the opening.